

# A Project to Reduce Bacteria in Texas Waterways: Lone Star Healthy Streams

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## Introduction

According to the *DRAFT 2008 Water Quality Inventory and 303(d) List*, 386 water bodies are impaired in Texas (Fig. 1). Of these, approximately half of the impairments are due to excessive bacteria.

Bacterial source tracking work in a number of water bodies has identified a contribution from grazing cattle to the bacteria loading of these streams. Grazing lands, which represent the dominant land use in the majority of watersheds in Texas, have received little attention until recently regarding the effect of grazing livestock on water quality. Thus, implementation of watershed management practices on grazing lands are critical to the success of water resource protection efforts in the state.

Landowner education and voluntary adoption of best management practices (BMPs) could substantially reduce bacterial contamination of streams and water bodies and reduce the likelihood of increased regulatory oversight. The Texas State Soil and Water Conservation Board (TSSWCB), local Soil and Water Conservation Districts and the USDA-NRCS support producers through technical assistance and cost-share programs enabling implementation of BMPs. For such measures to be effective, however, they must be properly implemented and managed to ensure sustainability. In addition, these practices must be compatible with the overall management system and not result in additional economic burden to agricultural producers.

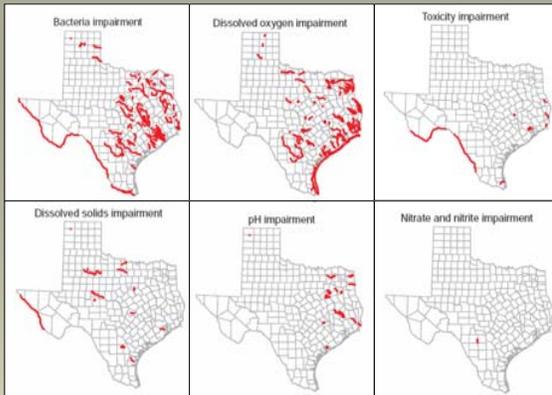


Figure 1. Water quality impairments in Texas, 2008, TCEQ.

The goal of *LONE STAR HEALTHY STREAMS* is to reduce levels of bacteria in Texas watersheds from grazing beef cattle (Fig 2). This goal will be accomplished by:

- Developing an educational curriculum delivering current knowledge in production and environmental management of grazing lands and their associated watersheds,
- Evaluating and demonstrating effectiveness of value-added BMPs in reducing bacteria of streams in a pilot watershed,
- Testing the functionality of the education program and making necessary changes and program modifications based on the results of the pilot project,
- Promoting Statewide adoption of appropriate BMPs and other watershed/water quality protection activities through education, outreach and technology transfer.

Funding for this project was provided by the TSSWCB with EPA 319 funds.

## Materials and Methods

A perennial stream segment, the Clear Fork of the Plum Creek, in Caldwell County, TX, was selected to evaluate alternative water sources as a relevant BMP that could reduce the time grazing livestock spend in or near riparian areas. The Clear Fork, as well as Plum Creek, are listed on the state of Texas 303(d) list as impaired due to bacteria.

Water to existing water troughs was terminated to force the cattle to obtain water from the stream segment. Water samples from the stream segment were then obtained twice monthly. One sample was obtained where the creek entered the cooperating landowner's property and a second sample was obtained just as it left the landowner's property. Water was analyzed for *E. coli* and expressed as colony forming units per 100 ml of water.

Concurrently, during the middle of each season of the year (summer, autumn, winter, and spring), eight randomly selected beef cows residing on the property were fitted with GPS collars (Fig. 2). The collars remained on the cows for approximately 21 days. Data points regarding the location of each cow was collected each five minutes. The data was analyzed to determine how much time the cows spent within close proximity to the stream.



Figure 2. Fitting GPS collars to cattle to evaluate behavior and movement patterns.

## Results

Levels of *E. coli* from the twice-monthly water sampling are shown in Figure 3. For 32% of the sampling dates, the level of *E. coli* in the water leaving the property exceeded the state standard for contact. For 79% of the sampling dates, the water leaving the property was higher in *E. coli* levels than the water entering the property. The time the GPS-collared cows spent in close proximity to the stream is shown in Figure 4. On average, cows spent approximately 7% of their time within 15 m of the stream.

Of considerable interest is the January 2008 data. Several calves became ill with bovine respiratory disease. In order to entice the cattle to the working pens where they could be medicated, the water troughs were activated. It was during this time the January GPS data was collected. There was a significant ( $P < 0.05$ ) reduction in the time cattle spent in close proximity to the stream (1.75% versus 7%) compared with the other sampling dates. This may indicated the effectiveness of altering cattle movement away from riparian areas using alternative water sources.

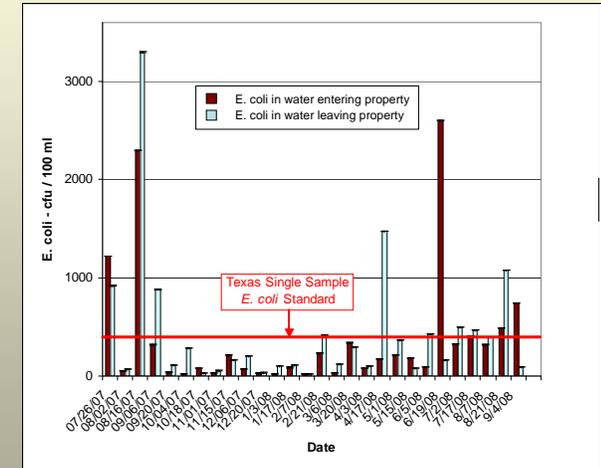


Figure 3. *E. coli* levels entering and leaving the project unit.

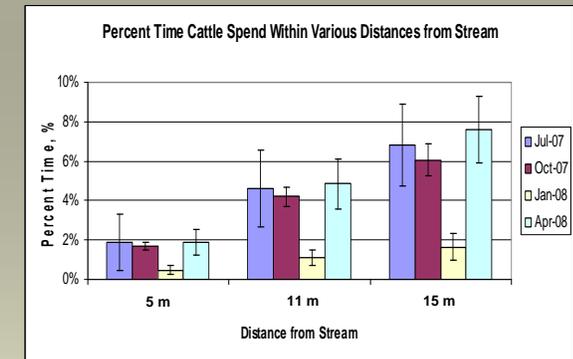


Figure 4. *E. coli* in water leaving property

## Summary and Future Efforts

During July 2008, water to the troughs was made available on a continuous basis and water samples for *E. coli* continued to be obtained on a twice-monthly basis from the stream segment. Likewise, cattle movement and behavior patterns are continuing to be monitored using GPS collars. Year 2 data will be contrasted with Year 1 data to determine the efficacy of the presence of alternative water sources on reducing the time cattle spent near the riparian area. We will also contrast the difference between Year 1 and Year 2 in *E. coli* values obtained from the stream. If the alternative water source provides the same dramatic decrease in time spent near the stream as was observed for the January 2008 sample date, the data may serve to validate the use of alternative water sources as a proactive measure with which beef cattle producers may use to reduce *E. coli* levels in Texas waterways. Additional BMPs need to be evaluated in the same manner.

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